

First year university physics students' perceptions of teaching methods

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Abstract. Maximization of students' academic experience through meaningful pedagogic tasks is central to the improvement of instruction in various instructional settings. The effectiveness of various teaching methods through which instruction is provided remains a key imperative for the realization of meaningful student academic performance. As part of this inquiry, Physics students' perceptions of various teaching methods were established through the administration of a survey questionnaire after which interviews were conducted to corroborate the views expressed. Responses to the questionnaire appeared to gravitate towards the lecture method and group discussion as preferred instructional methods. Implications for the improvement of instruction are discussed.

1. Introduction

The improvement of instruction through the incorporation of meaningful pedagogic tasks remains a key goal underpinning the provision of quality education. The utilisation of various teaching methods as vital instructional tools ought to add pedagogic value to the enhancement of scientific literacy in particular. Various teaching methods elicit a wide variety of students' perceptions in terms of their effectiveness. It is imperative for instructors to present content and skills in ways that serve to enhance the opportunities for students to learn. It has been established that students are qualified sources to report on the extent to which the learning experience is productive, informative, satisfying, or worthwhile [1]. This inquiry explored university physics students' perceptions of various teaching methods within a formal instructional setting.

2. Student learning

Students' perceptions of the learning process play an increasingly significant role in the assessment of the learning experience. However, these perceptions cannot necessarily serve as direct measures of instructor or course effectiveness but can serve as legitimate indicators of students' satisfaction [1]. More specifically, student ratings of instructional methods tend to be reliable, valid, relatively unbiased and useful [2]. The need to assess the effectiveness of various teaching methods used within the higher education sector in particular is paramount. Instructors often grapple with student academic performance from various perspectives in an attempt to comprehend the social and cognitive dynamics associated with the learning process. The prevailing conundrum is that students have little experience to determine whether teaching methods adopted by individual instructors are appropriate or not [3].

The situation in this regard is exacerbated by the raging discourse about the definition of teaching or teaching effectiveness. Effective teaching is defined as teaching that produces beneficial and purposeful student learning through the use of appropriate procedures [4]. On the other hand, effective teaching is defined from another alternative intellectual perspective as the creation of situations in which appropriate learning occurs [5]. Adequate intellectual consensus on the definition of effective teaching is certainly required to provide appropriate critical basis for engaging with the dynamics associated with instructional setting in a constructive and meaningful manner.

3. Methodology

Physics students' perceptions of various teaching methods were established through the administration of a survey questionnaire after which interviews were conducted to corroborate the views expressed. The questionnaire was administered with first year university physics students enrolled for academic programmes in Chiropractic and Homoeopathy, Chemical Engineering and Analytic Chemistry. The students were drawn from the Faculties of Health Sciences, Engineering and Science. Rating of teaching methods on the questionnaire was done on a scale of 1-5 with 1 being the least interesting and 5 being the most interesting teaching method.

4. Findings

Chiropractic and Homoeopathy cohort demonstrated a general preference for lecture method, group discussion and workshop as instructional methods as depicted in Table 1 below.

Table 1. Rating of various teaching methods (Chiropractic and Homoeopathy cohort)

Teaching Method	Rating					Number of students
	1	2	3	4	5	
	%	%	%	%	%	
Lecture method	2%	8%	26%	42%	23%	65
Group discussion	3%	6%	28%	38%	25%	64
Individual presentation	22%	18%	25%	19%	16%	65
Assignments	15%	23%	36%	18%	8%	61
Seminars	22%	15%	34%	17%	12%	65
Workshop	15%	10%	16%	41%	18%	61
Conference	31%	14%	31%	17%	7%	58
Brainstorming	9%	12%	22%	26%	31%	58
Role play	26%	16%	16%	21%	21%	62
Case study	21%	15%	25%	26%	13%	61

The rating by Chemical Engineering cohort gravitated towards lecture method, group discussion, workshop, brainstorming as well as role-play as depicted in Table 2 below.

Table 2. Rating of various teaching methods (Chemical Engineering cohort)

Teaching Method	Rating					Number of students
	1	2	3	4	5	
	%	%	%	%	%	
Lecture method	0%	1%	9%	24%	66%	79
Group discussion	10%	13%	24%	27%	40%	67
Individual presentation	13%	11%	33%	21%	21%	70
Assignments	17%	7%	19%	39%	17%	69
Seminars	16%	15%	31%	20%	18%	55
Workshop	3%	7%	9%	24%	58%	76
Conference	25%	15%	23%	19%	17%	52
Brainstorming	7%	5%	7%	38%	44%	77
Role play	8%	8%	13%	22%	50%	64
Case study	8%	8%	28%	23%	34%	65

The rating by Analytic Chemistry cohort (Table 3) gravitated towards lecture method, workshop, brainstorming as well as role-play. Group discussion was least preferred as compared to Chiropractic and Homoeopathy and Chemical Engineering cohorts.

Table 3. Rating of various teaching methods (Analytic Chemistry cohort)

Teaching Method	Rating					Number of students
	1	2	3	4	5	
	%	%	%	%	%	
Lecture method	0%	0%	18%	33%	49%	39
Group discussion	9%	0%	18%	38%	35%	34
Individual presentation	20%	11%	23%	26%	20%	35
Assignments	5%	10%	31%	33%	21%	39
Seminars	9%	21%	29%	27%	15%	34
Workshop	9%	11%	26%	43%	11%	35
Conference	15%	21%	29%	27%	9%	34
Brainstorming	0%	9%	12%	58%	21%	33
Role play	14%	14%	16%	43%	14%	37
Case study	8%	22%	17%	33%	19%	36

Students provided reasons which essentially captured their perceptions about their preference for particular instructional methods. Tables 4 and 5 below depict students' perceptions in relation to specific instructional methods.

Table 4. Students' perceptions of various teaching methods

Lecture method	Group discussion	Individual presentation	Assignments	Seminars
Provides opportunities for gaining knowledge Provides opportunities for knowledge expansion Interactions with the instructor Provision of resource material Development of appropriate conceptual understanding through illustration Reflection on key components of the course Provision of detailed explanations Lack of individual attention Clarification of complex concepts Opportunities for note taking Little time to critically reflect on information	Provides opportunities to exchanging new ideas Interactions Knowledge sharing Alternative explanations Development of conceptual clarity Critical engagement with various perspectives Better understanding fostered Development of problem-solving and analytical skills Active participation Stimulation of curiosity Development of thinking skills	Focused attention Isolation Focus on individual weaknesses and strengths Lack of confidence a major impediment Stressful Intimidating Opportunities for self-study Research opportunities Fear Tedious Repetitive	Marks versus learning Reinforcement of knowledge Research opportunities Performance of intellectually challenging tasks Sense of ownership Difficult to complete demanding tasks properly Requires determination Requires work ethic Improves subject matter knowledge Lack of resources stifles task completion Prolonged engagement duration	Provides presentations which are sources of critical information Interactions Tedious Gain deeper insight Require high levels of concentration Provides orientation to learning Research opportunities Critical engagement with various perspectives Knowledge sharing Clarification of complex concepts Knowledge sharing

Table 5. Students' perceptions of various teaching methods

Workshop	Conference	Brainstorming	Role play	Case study
Practical application of theoretical knowledge Gain deeper insight Information sharing Revision opportunities Review opportunities Good exam preparation Knowledge enhancement Detailed explanations	Time consuming Tedious Strenuous Require high levels of concentration Source of key information Interactions Development of concrete understanding Knowledge sharing	Hard to get things done Opportunities to critically engage with various perspectives Sharing of ideas Deeper reflection Facilitate learning Facilitate critical thinking Thought provoking Knowledge sharing	Active participation Hard work Requires determination Requires work ethic Development of critical understanding Active engagement with real-life situations Intimidating Challenge to introverts	Active engagement with real-life situations Active participation Practical application of theoretical knowledge Source of information Gain deeper insight Interactions Thought provoking Knowledge sharing

5. Discussion

The most prominent instructional methods preferred by the students were lecture method, group discussion, workshop, brainstorming as well as role-play. In particular, students demonstrated profound inclination to the lecture method. The lecture method is essentially a traditional instructional method widely utilised in various instructional settings. This profound inclination to the lecture method could be attributed to the fact that it is predominantly used at schools within the broader South African context. The characteristic features of each instructional method were explained to the students before the survey was conducted to ensure that the students were familiar with the nature of the various instructional methods under consideration. The survey was conducted at the end of the academic year. The differences between the three cohorts can partly be attributed to the teaching philosophies of the qualification offering faculties. It has been established that the lecture method leads to the development of the ability to recall facts while group discussion produces higher level of comprehension [6]. In addition, research conducted on the efficacy of group discussion revealed that group-oriented discussion methods produce favourable student performance outcomes and foster greater participation, self-confidence and leadership ability [7,8]. These notions are consistent with the views expressed by the students to justify their preference for prominent instructional methods. In terms of pedagogic innovation, a combination of instructional methods could facilitate the creation of sustainable opportunities for students to derive rich benefits to aid significant improvement of performance outcomes. Research conducted on the efficacy of the combination of the lecture method and group discussion revealed that the combination itself results in superior retention of material among students [9]. The need for active learning within the South African context is crucially important as a critical basis for fostering meaningful curriculum reform underpinned by constructivism as a contemporary educational perspective. By its very nature, constructivism provides opportunities for active engagement with the learning process through participation in discussions and collaborative activities [10].

6. Conclusion

Students expressed a wide variety of views about their preference for various instructional methods. For the benefit of coherent curriculum reform and the enhancement of pedagogic innovation, a conflation of instructional methods promoting active engagement with the learning process based on constructivist principles are advocated. The development of problem-solving and critical thinking skills in particular can be fostered through interventions of this nature. Students' perceptions about various teaching methods ought to be harnessed for meaningful improvement of instruction and sustained promotion of best professional practices.

References

- [1] Theall M Franklin J 2001 *Looking for Bias in all the Wrong Places – A Search for Truth or a Witch Hunt in Student Ratings of Instruction?* In the student ratings debate: Are they valid? How can we best use them? Theall P Abrami L and Lisa Mets (Eds) *New Directions in Educational Research*, no 109 (San Francisco: Jossey-Bass)
- [2] Murray H G 1994 *Can Teaching be Improved?* (Canada: Brock University)
- [3] Doyle T 2008 *Evaluating Teachers Effectiveness*. Retrieved April 25, 2016, from http://www.ferris.edu/fctl/Teaching_and_Learning_Tips/.../Eva/TeachEffec.htm.
- [4] Centra J A 1993 *Reflective Faculty Evaluation* San Francisco (CA: Jossey-Bass)
- [5] Braskamp L A Ory J C 1994 *Assessing Faculty Work: Enhancing Individual and Instructional Performance*. (San Francisco CA: Jossey-Bass)
- [6] De Caprariis P Barman C Magee P 2001 Monitoring the benefits of active learning exercises in introductory survey courses in science: An attempt to improve the education of prospective public school teachers *J. of Sch. of Teach. and Learn.* **1** 1-11
- [7] Perkins D Saris N 2001 A jigsaw classroom technique for undergraduate statistics courses. *Teach. of Psych* **28**(2) 111-113
- [8] Yoder J Hochevar C 2005 Encouraging active learning can improve students' performance on examinations *Teach. of Psych* **32** 91-95.
- [9] Morgan R Whorton J Gunsalus C 2000 A comparison of short-term and long-term retention: Lecture combined with discussion versus cooperative learning *J. of Instr. Psych.* **27** 53-58.
- [10] Fosnot C 1989 *Enquiring Teachers, Enquiring Learners* (New York: Teachers College Press)